MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

DCS5058 – OPERATING SYSTEMS

(DIT & DBIS)

1 JUNE 2018
3:00 p.m – 5:00 p.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 pages with **2** sections.
2. Answer ALL questions.
3. Write your answers in the answer booklet provided.

Section A: Fill in the blanks (Total: 20 Marks)

Instruction: *Fill in the blanks with the terms given in the table. Write your answers in the* ***Answer Booklet*** *provided.*

Caching	Process creation	Thrashing	Direct Access	Indexed Access
Two-state	Memory-Mapped-Files	Copy-on-Write	Paging	Suspended
Five-state	Volatility	Turnover time	System calls	First-come-first-served
Compaction	Group ID	Hold-and-wait	Tightly coupled system	Loosely coupled system
Deadlock detection	Deadlock prevention	Ability to evolve	Kernel	Microkernel

1. Main objectives of operating system are efficiency, convenience and _____.
2. _____ is a system where processors share memory and a clock.
3. _____ is copying information into faster storage system.
4. Storage system is organized in hierarchy based on speed, cost and _____.
5. When an interrupt or fault occurs, hardware switches to _____ mode.
6. _____ provide the interface between a running program and the operating system.
7. _____ is a small operating system core which contains only essential core operating systems functions.
8. In _____ process model, a process may be in either running or not running state.
9. _____ occurs when a new process is to be added to those currently being managed process.
10. One of the characteristics of a _____ process is that the process is not immediately available for execution.

Continued...

11. _____ includes actual execution time plus time spent waiting for resources.

12. With _____ scheduling, when the currently running process ceases to execute, the process that has been in the ready queue the longest is selected for running.

13. In _____ condition, a process may hold allocated resources while awaiting assignment of other resources.

14. To deal with deadlock, one of the approaches is _____ which allows the system to enter a deadlock state and then take action to recover.

15. _____ is a technique for overcoming external fragmentation.

16. _____ allows main memory to be partitioned into small equal fixed-size chunks and divide each process into the same size chunks.

17. _____ allows file I/O to be treated as routine memory access by mapping a disk block to a page in memory.

18. _____ occurs when a computer's virtual memory subsystem is in a constant state of high paging activity.

19. _____ is a subset of users who can share access to the file.

20. In _____ method, file is viewed as a numbered sequence of blocks/ records.

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Section B: Structured Questions, 4 Questions (Total: 80 Marks)
Instruction: *Answer ALL the questions in the Answer Booklet provided.*

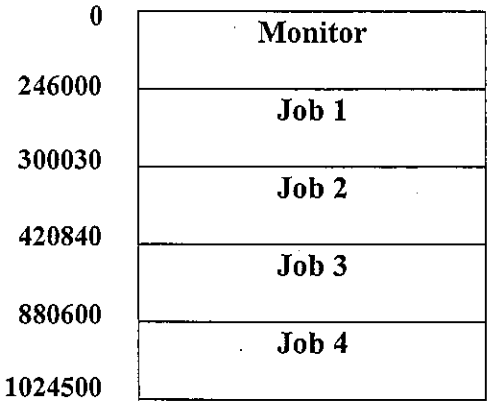
QUESTION 1 (20 Marks)

a. List and explain **TWO (2)** problems of *serial processing.* (4 Marks)

b. Explain the ways interrupt is being handled in the computer systems. (4 Marks)

c. Define base register and limit register. (2 Marks)

d. Given the memory layout as below, determine the base registers and limit registers for Job 1 and Job 3. (4 Marks)



e. Name **TWO (2)** interprocess communication model (a) and (b) in **Figure 1** and explain how they work. (6 Marks)

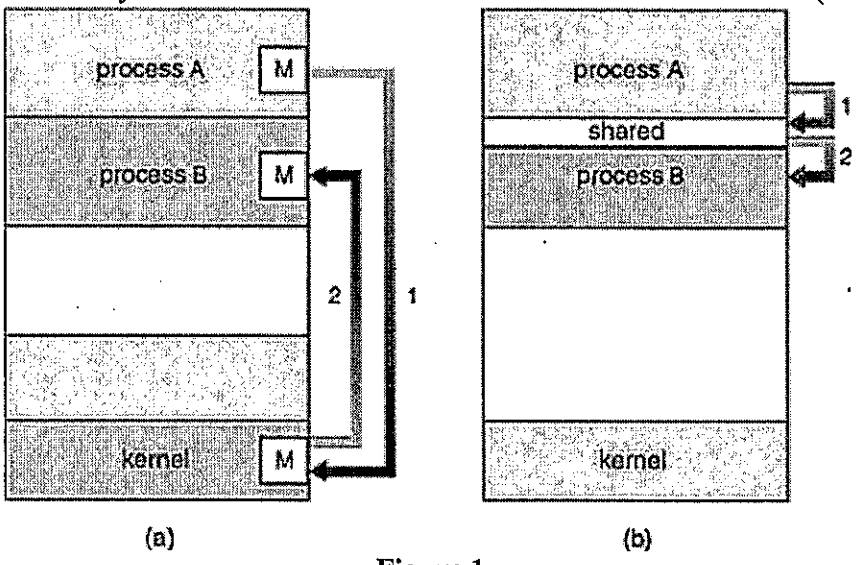


Figure 1

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QUESTION 2 (20 Marks)

a. While the program is executing, the process can be uniquely characterised by a number of elements."
List and explain any **FOUR (4)** elements of a process. (4 Marks)

b. **Table 1** shows the processes with the length of the CPU burst time given in milliseconds. The processes arrived according to the arrival time.

Process	Arrival Time *(ms)*	Burst Time *(ms)*	Priority
P_0	4	11	3
P_1	3	7	2
P_2	5	12	3
P_3	4	9	1
P_4	0	6	2

Table 1

Draw Gantt Charts illustrating the execution of these processors using the following scheduling algorithms. Calculate the ***waiting time*** for each process and the ***average waiting time***.

i. Non-preemptive Priority (6 Marks)
ii. Round Robin (Quantum = 6) (10 Marks)

QUESTION 3 (20 Marks)

a. Consider a system with **four** processes P_0, P_1, P_2 and P_3 and **three** resource types: Scanner (13 instances), Disk Drive (9 instances), Tape Drive (12 instances).

	Scanner		Disk Drive		Tape Drive	
	Max	**Allocation**	**Max**	**Allocation**	**Max**	**Allocation**
P_0	10	1	6	0	8	2
P_1	8	4	7	2	8	0
P_2	9	3	4	0	1	1
P_3	6	0	5	1	2	1

Table 2

Continued...

Available		
Scanner	**Disk Drive**	**Tape Drive**
5	6	8

Table 3

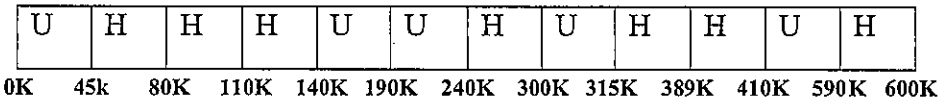
i. Based on the requirements, current allocations and available resources are given in **Table 2** and **Table 3**. Determine the content of the matrix *Need*. (2 Marks)

ii. If P_1 requests for additional instances (1, 0, 0), can this request be granted? Justify your answer. (*update relevant tables: allocation resources, remaining needs and available resources*). (8 Marks)

b. Describe fixed-size partitioning in main memory and its weakness. (3 Marks)

c. Differentiate between logical address and physical address. (2 Marks)

d. Given a heap of memory management scheme with the following free list:



* U - Used
* H - Hole

The following process request will be received in order as in **Table 4**:

Process Number	Size in Kilobytes
1	25
2	35
3	6
4	19
5	11

Table 4

Show how the memory requests above are allocated using the following memory allocation schemes.

i. Best Fit (BF) (2.5 Marks)
ii. Worst Fit (WF) (2.5 Marks)

Continued...

QUESTION 4 (20 Marks)

a. Consider the following page reference string:

a, c, b, a, d, d, e, c, b, a, c, d, e, c, a

Assuming a paging scheme with **FOUR (4)** frames is initially empty. Trace the allocation of pages to frames and determine the number of *page faults* occur using the following page replacement algorithms:

i. Optimal (4 Marks)
ii. Least Recently Used (LRU) (4 Marks)

b. Explain the steps of page-replacement. (4 Marks)

c. Define file system. (2 Marks)

d. Device directory responsible to record information about file. List **TWO (2)** types information it should record. (2 Marks)

e. Identify **TWO (2)** disadvantages of the following file allocation methods:

i. contiguous allocation (2 Marks)
ii. linked allocation (2 Marks)

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